

# ***Standard-compatible Multiple-Description Coding (MDC) and Layered Coding (LC) of Audio/Video Streams***

**draft-vitali-ietf-avt-mdc-lc-00.txt**

submitted to IETF in July 2005

# Outline

5 slides

- Error resilient encoding
- Multiple Description video coding
- The proposed framework, new SDP attributes
- Conclusions

# Error-resilient encoding

## ■ Robust encoding

- Intra rate, macroblock intra refresh, flexible macroblock order, asynchronous slice order, interleaved prediction policies, concealment motion vectors, redundant slices, etc.
- It's an encoder strategy that doesn't need IETF standardization
- Difficult to choose adequate parameters

## ■ Forward Error Correction (FEC at application layer)

- XOR as per RFC 2733, Reed-Solomon matrix (MPE-FEC), etc.
- Suffer from delay problems and cliff effect (all or nothing)

## ■ Layered Coding (LC)

- Allows several types of **scalability**
- Requires stream prioritization while prioritization may not be available

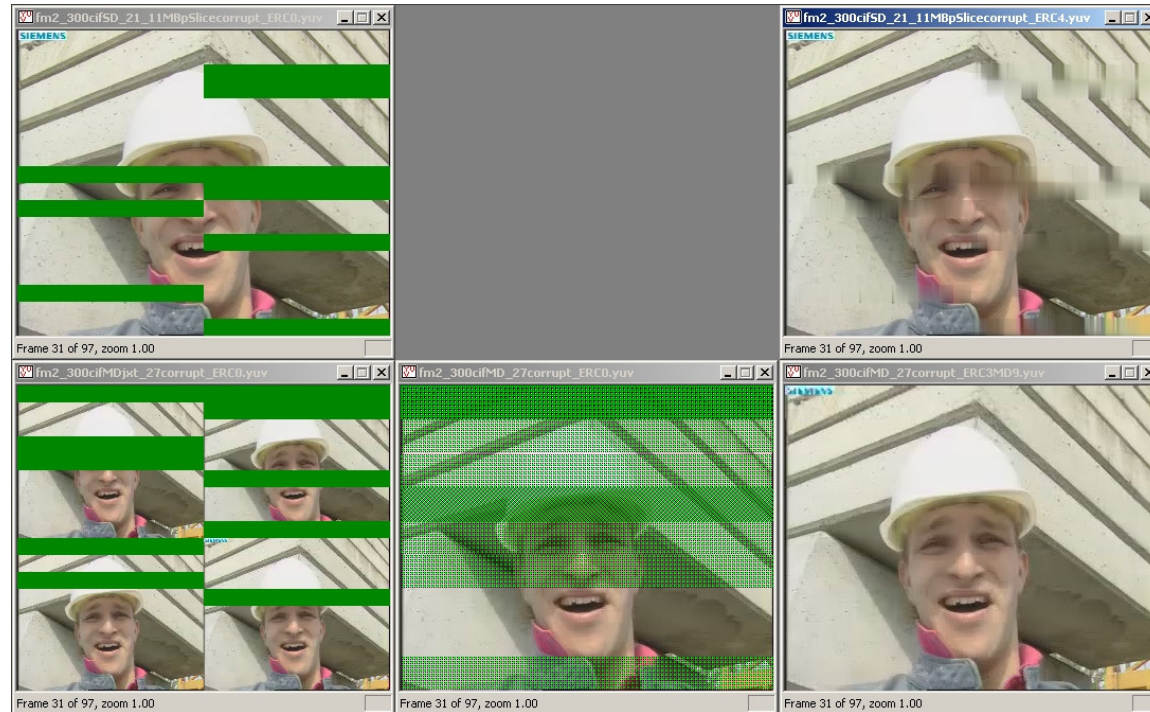
## ■ Multiple Description Coding (MDC)

- Allows **scalability** and it is very **robust** (suitable for high loss rates)
- No normative rule for MD encoded video transmissions

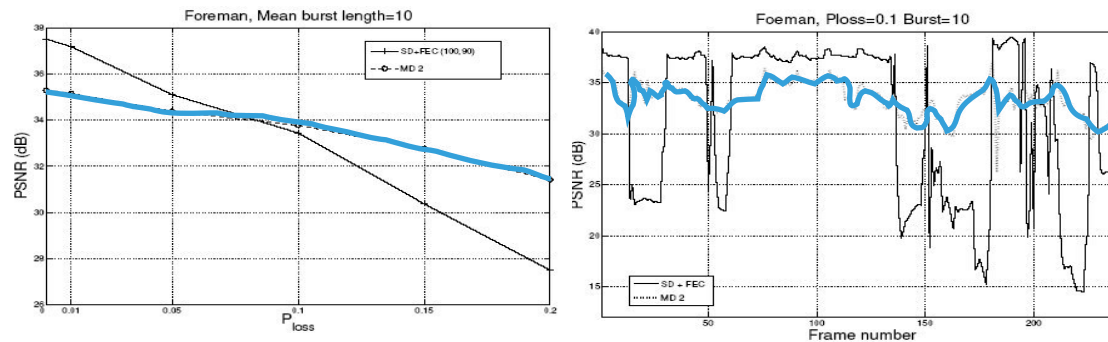
# Multiple Description

Foreseen applications:

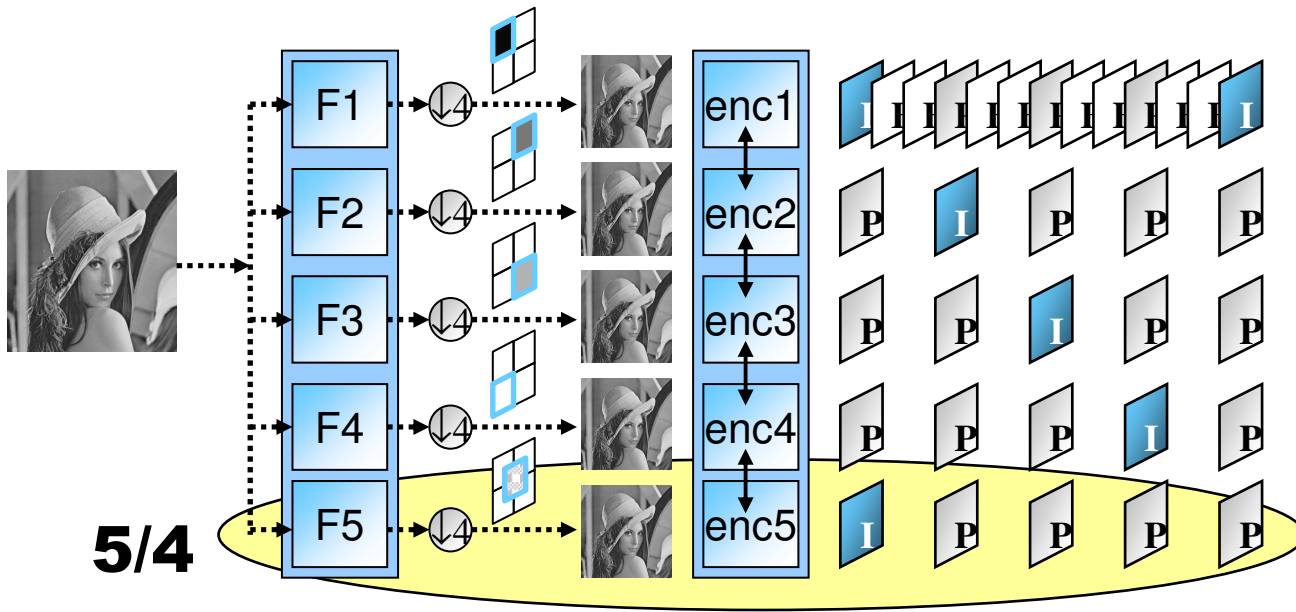
- Easy cell hand-over
- Adaptation to low resolution/power/memory
- Easy Picture-in-Picture (no 2nd full decoder + rescaler)
- Better delivered quality (no worst case)
- Adaptation to varying bandwidth
- Multi-standard support (simulcast w/out simulcast)
- Divide-et-impera approach for HDTV distribution
- Enhanced carousel
- Pay-per-quality



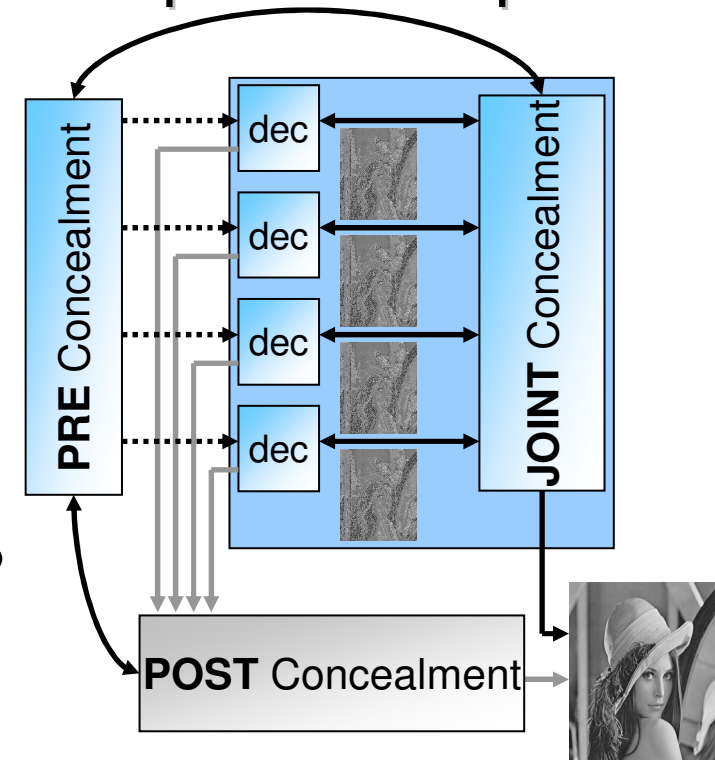
**4MD vs.  
Single  
Description**



**2MD vs.  
Reed  
Solomon**



## Multiple Description



## Standardization effort

- **Backward compatible framework:** MD can be seen as fake replicated SD
- Reuse of existing **MIME types** (e.g. to signal underlying video codec) and existing **SDP attributes** (rtptime, fmtp, ...) via RTSP (Vod) or SAP (Multicast)
- **New SDP attributes:**
  - how descriptions are created (filter, downsampling)
  - how descriptions can be merged (depending on the loss pattern)

# SDP attributes

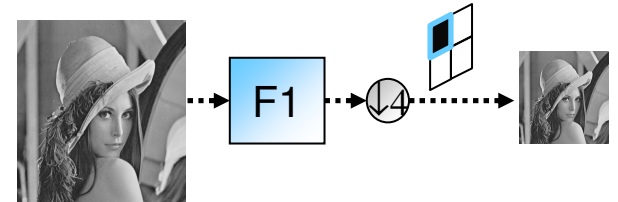
Attributes (BNF grammar as per RFC 2234)

- a=X-mdclt-tag: *payload-type tag*
- a=X-mdclt-pre: \*(tag = *expr*;



**Simplified set (but no LC!)**

- a=X-mdclt-tag: *payload-type tag*  
*FIR(params) dn(params) ...etc.*



- a=X-mdclt-group: *group-tag* +(tag)
- a=X-mdclt-post: *group-tag* \*(tag = *expr*;

- a=X-mdclt-group: *group-tag* +(tag)

**Expressions:** operators as + and -,

up(factor, phase, x|y|z, tag), dn(factor, phase, x|y|z, tag),  
FIR([coefficients], tag [,InitialConditions])

**RFC 3388 tagging/grouping cannot be used, it is replicated here**

- simultaneous encoding explicitly forbidden (no MDC)
- grouping of layers explicitly forbidden (no LC)

# Conclusions

- RFC 3388 can be modified to allow LC and MDC?
- New attributes: use simplified set? ...only MDC, no LC.

THANKS!

**Reference software available.** Write to [andrea.vitali@st.com](mailto:andrea.vitali@st.com)

- CIF video sequences, H.264 encoder (JM 86 compatible)
- Channel simulator (loss patterns are logged)
- Real-time H.264 decoder for SD
- Real-time H.264 decoder with joint MD concealment
- Real-time viewer with GUI